BEYOND the PLANET of ORIGIN

Lunar Dust Toxicology Workshop

Precursor Flight Opportunities for Mitigating Risk

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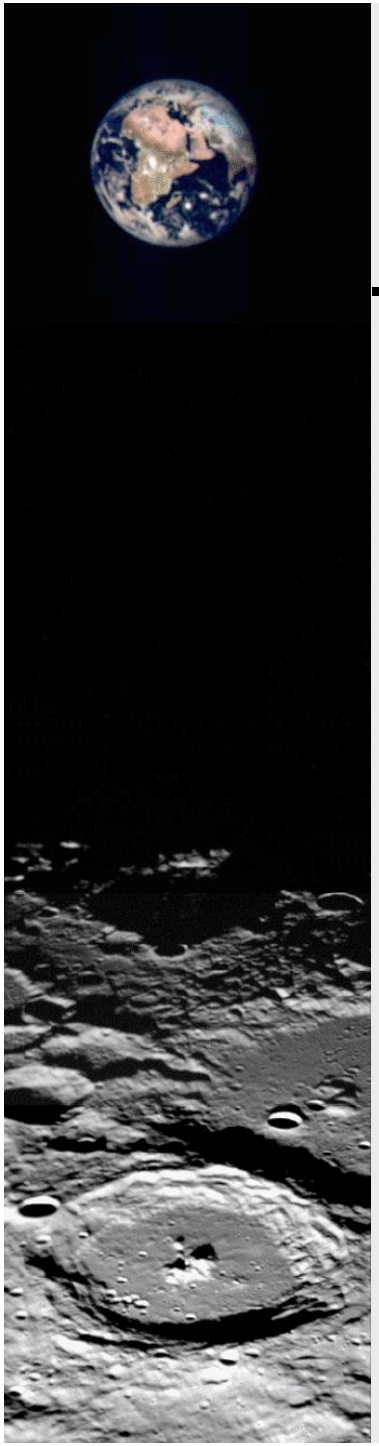


Overview

- Flight investigations may be needed to adequately characterize Lunar Dust, determine whether hypogravity affects risk assessments, and test mitigation strategies.

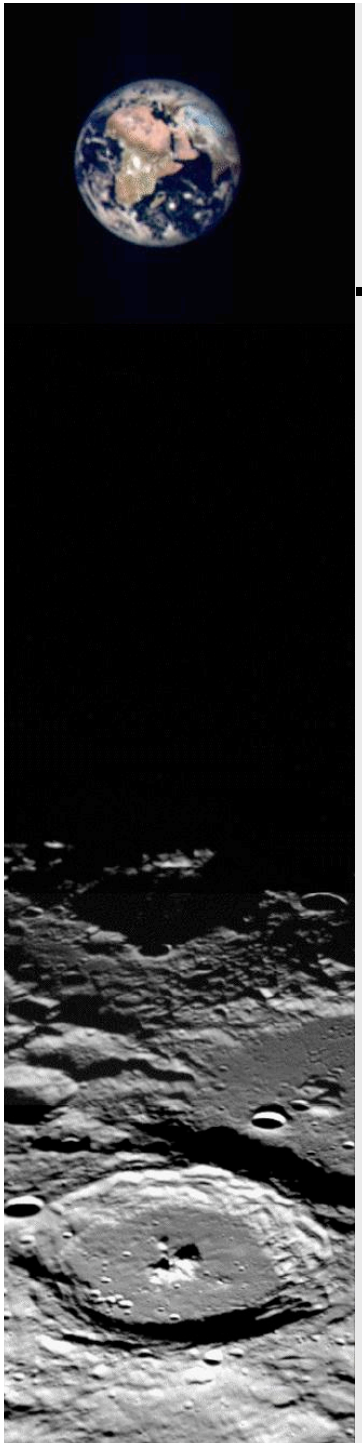
- Venues available: Free Flyers, Shuttle, Space Station, Lunar Orbiters, Lunar Landers, Crewed Lunar Laboratories
  - Flight habitats and laboratories for animal research are available for LEO crewed and free flyer laboratories that can serve as models for lunar studies
    - *Mammalian research may not be appropriate for lunar robotic missions.*
  - NASA has not yet decided on a Lunar Sample Return

- Flight investigations are expensive and infrequent
  - Flight investigations using crew are possible but constrained
  - Use ground based research as much as possible

- But Safety is the highest concern --
  use what you need to get the job done right.

Summary of Flight Opportunities

	Nominal Payload Characteristics	Data/Specimens	Crew Support	Lunar Gravity or Simulated Lunar Gravity	Data Recovery
Free Flyers: BioCosmos >available now	8 feet in diameter and can carry nearly 2000 pounds of payload	Primates, rodents, insects, plants, cells and tissues	No	No	Telemetry and Return to Earth
Space Shuttle >2005	Middeck locker investigations	Humans, rodents, insects, plants, cells and tissues	No	No	Telemetry and Return to Earth
ISS >2007 for animal research	Middeck to Double Racks, Laboratory instruments, glove box	Humans, rodents, insects, plants, cells and tissues	Yes	Maybe – Centrifuge and animal research decisions in progress	Telemetry, in situ analysis, and return to Earth
Lunar Orbiters >2009	Small and low power – Shoebox size	Environmental data, insects, plants, cells and tissues	No	No	Telemetry only
Lunar Landers >2010	Small and low power – Shoebox size	Environmental data, in situ dust characterization, insects, plants, cells and tissues	No	Yes	Telemetry only
Crewed Lunar Laboratories (in planning) >2015	Middeck to Double Rack sizes, laboratory instruments, glove box	rodents, insects, plants, cells and tissues	Yes	Yes	Telemetry, in situ analysis, and return to Earth



For Further Information

- BioCosmos: http://baby.indstate.edu/asgsb/bion.html
- Space Shuttle: http://fundamentalbiology.arc.nasa.gov/PI/PI_flthdw.html
- Space Station: http://brp.arc.nasa.gov/
- Lunar Precursors: http://www.hq.nasa.gov/office/apio/pdf/moon/01_robotic_archit.pdf.
- Lunar Biology concepts: http://205.149.68/bbpo/
- KC-135: http://jsc-aircraft-ops.jsc.nasa.gov/Reduced_Gravity/guides.htm